Physical Review D - Particles, Fields, Gravitation and Cosmology 1999 vol.59 N6, pages 1-12

Ground state energy of a massive scalar field in the background of a cosmic string of finite thickness

Khusnutdinov N., Bordag M.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

We calculate the ground state energy of a massive scalar field in the background of a cosmic string of finite thickness (Gott-Hiscock metric). Using zeta functional regularization we discuss the renormalization and the relevant heat kernel coefficients in detail. The finite (nonlocal) part of the ground state energy is calculated in 2+1 dimensions in the approximation of a small mass density of the string. By a numerical calculation it is shown to vanish as a function of the radius of the string and of the parameter ξ of the nonconformal coupling.